

AD-A141 370

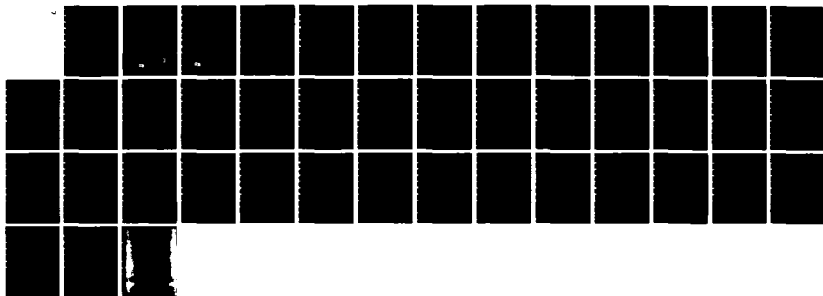
THE FRENCH STRATEGIC DILEMMA(U) CENTER FOR NAVAL
ANALYSES ALEXANDRIA VA NAVAL PLANNING AND MANAGEMENT
DIV R F LAIRD MAR 84 CNA-PP-487

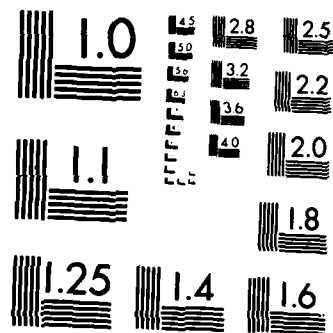
1/1

UNCLASSIFIED

F/G 5/4

NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

PROFESSIONAL PAPER 407 / March 1984

THE FRENCH STRATEGIC DILEMMA

Robbin F. Laird

AD-A141 370

DTIC FILE COPY

DTIC
ELECTE
MAY 21 1984
S D



CENTER FOR NAVAL ANALYSES

DISTRIBUTION STATEMENT A

Approved for public release;
Distribution Unlimited

84 05 21 056

THE FRENCH STRATEGIC DILEMMA

Robbin F. Laird

Accession For	
NTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
AI	



Naval Planning and Management Division

CENTER FOR NAVAL ANALYSES

2000 North Beauregard Street, Alexandria, Virginia 22311

DISTRIBUTION STATEMENT A

Approved for public release;
Distribution Unlimited

THE FRENCH STRATEGIC DILEMMA

This paper identifies a basic strategic dilemma for France. On the one hand, French leaders identify the political purpose of nuclear weapons as the defense of French territory or, at best, of France's "vital interests." On the other hand, a number of external pressures are inducing a need for France to provide a more explicit definition of the role of French nuclear weapons in the West European security system. In particular, the central tension in French doctrine revolves around the emphasis on protecting the national "sanctuary" with nuclear weapons and the growing recognition of the need to include West Germany in the French security concept.

The paper is divided into four sections. The first section examines the basic elements of French doctrine. For the purposes of this paper, the discussion of French doctrine is limited to identifying the response to one central question: What political purposes are served by French nuclear forces? The second section examines the variety of external pressures which challenge the credibility of the French deterrent, thereby creating a need for change in French doctrine. The third section identifies and discusses the resulting French strategic dilemma. The final section analyzes the basic French defense options in the 1980s as reflected in the discussions of defense policy in France. This section concludes with an assessment of the alternative scenarios for the evolution of French defense policy in the 1980s and 1990s.

I. FRENCH STRATEGIC DOCTRINE

The central element of the French approach to nuclear weapons is to see them as fundamentally different from conventional weapons in posing the gravest questions of life and death. The radical nature of these weapons in terms of the level of destructiveness which they can inflict

make them usable only when the very survival of a nation is at stake. It would be difficult for a nation, even the United States, to risk its ultimate survival for the sake of its allies. Hence, to defend itself in the nuclear era, France needed to develop an independent nuclear force.¹

There are a number of ideas the French have developed associated with their perceived need for an independent national deterrent.² First, the French believe that possession of nuclear weapons turns French territory into a "sanctuary." If France has the capability to attack Soviet territory directly with nuclear weapons, then France is less likely to be subject to Soviet nuclear strikes. French territory is thereby "sanctuarized" by her possession of nuclear weapons.

The French have been among the most vigorous of the Europeans to cast doubt on American willingness to use its nuclear weapons to implement an extended deterrence strategy. At the time of the establishment of the French nuclear forces in the mid-1960s de Gaulle coined the phrase that the Americans would not be willing to trade New York for Hamburg in a nuclear war with the Soviet Union. The French have strongly criticized the U.S. concept of flexible response from its inception.³ The French have perceived this concept as simply reflecting American unwillingness to strike Soviet territory with nuclear weapons in light of Soviet assured destruction capability against U.S. territory.

In the case of the superpowers, the French tend to focus on the centrality of political will to deterrence, rather than on the presence of a strategic weapons balance alone. Even though the U.S. continues to have strategic parity with the Soviets, the Americans might not have the will to use those weapons in European war limited to the European theater. France, by having its very national survival at stake in a European war, would appear more likely to the Soviets to have the

political will to use nuclear weapons. The Soviets are thereby deterred, in part, by having an alternative nuclear decisionmaking center in the West to the U.S. The French cite NATO's Ottawa Declaration of 1974 as providing explicit U.S. recognition of the legitimacy of their position that alternative decisionmaking centers heighten the credibility of the Western deterrent.

The classic French position equates the use of nuclear weapons with the defense solely of French territory per se. For example, General Poirier, the prominent French strategic thinker, has conceptualized the French security situation as consisting of three circles. Nuclear weapons protect the "national sanctuary," i.e., the first circle. The second circle encompasses the defense of France's immediate periphery. The third is the defense of France's interests in Africa and the Third World. In Poirier's schema nuclear weapons are inextricably intertwined with the defense of the first circle, but only ambiguously related to the defense of the second circle.⁴

The French can border on the caustic in describing the virtues of their independent nuclear deterrent. In spite of the independence of French nuclear forces, however, their credibility as a deterrent rests in large part on their ability to operate "behind" American nuclear forces. The preoccupation the Soviets must have with American forces provides a significant "force multiplier" to the French forces. The language of "independence" can obscure the significance of the American deterrent to the credibility of the French deterrent.

A close examination of the substance of three key expressions of French doctrine, in particular, reveals the significance of the American deterrent to the credibility of the French deterrent. First, the French speak of their deterrence as that of the "weak of the strong." This approach to deterrence is rooted in the clear recognition of the limits within which French strategic power must operate. They can never hope

to match the Soviets in the size or diversity of nuclear forces. The Soviets have significant advantages in geographic expanse as well which would allow them to conduct "limited" nuclear strikes against France. France cannot hope to have an equivalent capability against the Soviet Union.

In reality, however, the French are really operating vis-a-vis the Soviets in a position of the strong deterred by the strong augmented by the weak. The Soviets are deterred in part by recognizing that the damage inflicted by the French might be significant enough to allow the U.S. to dominate the war termination process. This Soviet concern significantly augments the deterrent effect of French forces.

Second, the French speak of "proportional deterrence." Their strategy is rooted in a capability to inflict damage greater than the value to the Soviets of destroying France. The credibility of "proportional deterrence" rests on the capability of France having survivable nuclear forces which can execute a highly destructive second strike.

Underwriting the "proportional deterrence" strategy as well is the U.S.-Soviet strategic nuclear standoff. One might be able to conceive of the willingness of the Soviets to risk part of their population and industrial assets in order to destroy France in an effort to win a war limited to the European theater. Proportional deterrence would fail as a strictly dyadic Soviet-French exchange. It is considerably more difficult to imagine the Soviets engaging in a strategic nuclear exchange with France which would leave Soviet military-economic capabilities severely eroded in the face of an American adversary which would have greatly enhanced prospects of dominating a war termination process.

Third, the French speak of implementing "proportional deterrence" through a countervalue as opposed to counterforce strategy. It is a strategy aimed not at warfighting--anti-force--but at assured destruction. In part this reflects the capabilities of French forces--they are limited in numbers and accuracy of warheads. In part this reflects French preference to pursue a deterrence strategy which does not threaten Soviet strategic forces and thereby lead to a Soviet desire to preempt French forces in the event of crisis.

The language of French strategic doctrine is that of dissuasion (deterrence). The French talk publicly much less about warfighting (and employment doctrine) than about how to persuade or dissuade the Soviets from ever rationally calculating that a European war would be worth fighting. French doctrinal language, by emphasizing dissuasion, is very sensitive to the importance of meeting domestic needs for a defense consensus and upon the development of forces which deter but do not threaten the Soviets in an intimidating fashion.

The language of dissuasion in domestic terms emphasizes the primacy of nuclear weapons for the defense of French territory. Much public discussion of the use of French nuclear weapons for any other purpose (e.g., the forward defense of West Germany) would increase the level of domestic debate, intensify conflict over the political purposes to which French nuclear forces would be put, and thereby, erode the level or intensity of public support for French nuclear weapons policy.⁵

The French are concerned to have credible, second strike forces, not first strike forces, to dissuade the Soviets from military adventurism in Europe. The SSBN has evolved as the most significant weapons system in this role.⁶ The French are not supportive of any Western military force structure deployments which would be suggestive

of first strike intentions (which might dangerously goad the Soviets into a preemptive nuclear war) or of any discussions by the U.S. of fighting a limited nuclear war in Europe.

Since the mid-1970s, French leaders have backed away from the more extreme public positions taken earlier regarding the independence of their defense policy. In part, this has entailed the restoration of some of the language of Alliance solidarity in French defense discourse. For former President Giscard d'Estaing, France was identified as a key player in the Alliance in which French nuclear weapons served Alliance interests indirectly by serving French interests directly. Giscard d'Estaing also publicly questioned the salience of the "all or nothing" character of the use of French nuclear weapons in a European war. He favored the development of a broader array of military options for France. The development of more flexibility inevitably entails greater intermeshing of French security interests with Alliance interests.⁷

The Mitterrand Administration has continued to search for more flexibility in meeting France's security interests in Europe by means of greater public and private involvement within the Alliance. Mitterrand's decision to host the NATO ministerial meetings in Paris in June 1983 was of symbolic importance in this regard.⁸ According to Pascal Krop of Le Matin, the socialist government has pursued a double objective in reasserting France's commitment to the Alliance, namely, "...to reassure the allies by assuring them of French support in case of conflict and, on the other hand, to develop a true European defense in case the Americans ultimately disengage themselves from Europe."⁹

In part, the language of Alliance solidarity is being restored to French defense discourse because of the perceived decline in Alliance cohesion. In theoretical terms, the French position is like that of the operation of an interest group in Mancur Olson's The Logic of Collective

Action.¹⁰ France could act with benign neglect when the U.S., as the force shaping the Alliance, could by itself provide for the "public good" of collective defense. With a decline in the ability of the U.S. to do so, the "public good" of Western defense has eroded. The French are left in the position of remaining aloof and watching further deterioration in collective capabilities or contributing directly to the enhancement of the "collective or public good" of Western defense capability.¹¹ The French are increasingly finding themselves in the position of having to more directly and publicly link their "independence" with the efficacy of overall Western defense capabilities in order to deter the Soviets.

At the heart of French doctrinal problems is their relationship with West Germany.¹² The development of closer Franco-German relations in the 1970s and 1980s has led to greater French sensitivity to the impact of the French nuclear issue on the Franco-German core to the European component of the Alliance.

The Giscard d'Estaing administration expanded the scope of potential interests served by French military power--including by implication the nuclear forces--by introducing a concept of an "enlarged sanctuary." The French have traditionally tied nuclear weapons use with the concept of the French territorial sanctuary. When the French chief of staff spoke publically in 1976 of France contemplating the defense of its European interests, specifically West Germany, as an "enlarged sanctuary" the implication was clear. The French government eased away from the use of this term when public criticism was leveled that France was thereby slipping away from its traditional position of defending a national "sanctuary," not an extended one.¹³

The Mitterrand Administration has clearly identified the defense of West Germany as a "vital interest" for France. The current French chief of staff clearly seemed to imply a linkage between the defense of West

Germany as a "vital interest" for France and the deployment of the new generation of tactical nuclear weapons.¹⁴ The public commitment by West Germany and France to animate the security provisions of their 1961 comprehensive bilateral agreements entails a provision for frequent bilateral meetings between the French and German ministry of defenses. Reportedly, one subject for discussion between the two countries has been the employment doctrine of French tactical nuclear weapons.¹⁵

A central tension in French doctrine clearly revolves around the emphasis on the primacy of independence defined as protecting the national "sanctuary" with nuclear weapons and the growing salience of the need to involve France in West German security issues.¹⁶ On the one hand, the French, in the context of justifying their exclusion from the U.S.-Soviet INF talks, have insisted that their nuclear weapons cannot be used to defend West Germany directly. On the other hand, the further development of any European alternative to American dominance of the Alliance--something which some French analysts favor--requires France to identify clearly their nuclear weapons with the defense of an "enlarged sanctuary."

The French are, however, in the throes of identifying their conventional forces with the forward defense of West Germany.¹⁷ Traditionally, the French have identified their conventional forces in West Germany, supported by tactical nuclear weapons, as having the function of "testing the enemy's intentions" or, in other words, operating primarily as a tripwire for French strategic forces. With the formation of the rapid action force (FAR), the Mitterrand Administration has underscored the importance of the forward defense of West Germany by conventional means. The decision by France and West Germany to coproduce a helicopter gunship may, in fact, be linked with the virtual commitment of the FAR to the forward defense concept.

In addition, when the Hades is deployed, probably in part with neutron warheads, it will be used to support actions of the FAR and the First Army stationed in West Germany. As a result, French nuclear weapons will become de facto more closely linked with the forward defense of West Germany. The French will stop short, however, of making explicit, public judgements about when or how their tactical nuclear weapons might or would be used in the defense of West Germany. France considers declaratory ambiguity on this question to be a key part of their deterrent posture.¹⁸

However, if NATO would not be able to mount a credible forward conventional defense, French doctrinal ambiguity is almost irrelevant to the militarily effective use of tactical nuclear weapons. It is questionable whether the Soviets would consider French use of tactical weapons as a realistic signal of the intention by France to use strategic weapons, unless their tactical nuclear weapons were used in a militarily efficacious manner.

The French treatment of the tactical nuclear issue most clearly reveals the operation of several of the elements of French strategic thinking identified so far. When the French first deployed tactical nuclear weapons in the early 1970s, they indicated that these weapons were an inextricable part of the strategic deterrent. They were to function as the warning shot to indicate French resolve to use strategic nuclear forces.¹⁹

For the French, their tactical nuclear weapons are to be clearly distinguished from those of the U.S. The French weapons are used as part of dissuasion; that is, to dissuade the Soviets from direct attacks against French territory. According to the French, their tactical nuclear weapons are not to be considered as battlefield weapons, whereas the American weapons are positioned to fight a limited nuclear war which might well engulf France. To maintain their limited role as an

"advertisement" of French resolve, only a limited number of French weapons need to be deployed.

The basic French position on tactical nuclear weapons fits well into their "national sanctuary" doctrine. However, adaptations to the Franco-German rapprochement have complicated the picture. First, Giscard d'Estaing publically questioned the credibility of the "all or nothing" strategy. He suggested the need for a more flexible strategy which implied a battlefield role for French tactical nuclear weapons.²⁰

Second, the decision in the mid-1970s to foster an R&D program to develop a neutron warhead fit in with a strategy for battlefield use of tactical nuclear weapons. The neutron warhead can be deployed in the mid-1980s, but it will not precede the deployment of the Hades missile.²¹ The neutron warhead can be used effectively primarily against Warsaw Pact armor and is designed to precede follow-on attacks by conventional forces.²² The deployment of the neutron warhead might then imply a willingness by France to engage in the forward defense of West Germany with a mix of conventional and tactical nuclear forces in a battlefield situation.²³

Third, some French analysts have expressed concern that the quality of the "advertisement" to be delivered against Soviet forces needs to be enhanced. There is a need to provide a real pause to Soviet military actions on the European battlefield to provide time for a favorable war termination process.²⁴ A forward defense of West Germany bolstered by tactical nuclear weapons could provide such a pause to the Soviets.

Tactical nuclear weapons are "anti-force" in character and contribute, despite declaratory intentions, to Soviet success or failure on the battlefield. In all likelihood, the Soviets are likely to perceive French tactical nuclear weapons, especially the new generation

weapons, as significant factors affecting the success of their operations on the European battlefield.

The tactical nuclear problem reflects a central tension in French doctrine between the public commitment to independence, on the one hand, and the public commitment to West Germany and the Alliance, on the other hand. The French are having difficulty having it both ways. The French would like to insist that their tactical nuclear weapons are only a fuse which would light the strategic arsenal, but the Soviets might well perceive them as battlefield weapons. In addition, the West Germans might well insist that the new generation of French tactical nuclear weapons ought to contribute to collective defense, not just to the defense of French territory.²⁵

II. EXTERNAL CHALLENGES

The French face a number of challenges to the credibility of their nuclear deterrent in the 1980s and 1990s which, in turn, underscore dilemmas in their doctrine. The most significant challenges are provided, of course, by the growth of Soviet military capability and doctrine. Many French military analysts tend to believe that the Soviets have adopted the conventional war option as their basic option for fighting a war in Europe.²⁶ These analysts tend to further believe that the threat to use nuclear weapons against Soviet territory is requisite to dissuade or deter the Soviets from attempting to implement their conventional option.

French military analysts tend to believe that the Soviets have a number of advantages which would allow them to prevail in a protracted war fought only with conventional forces. Most significant in this regard are the following: Soviet geographical proximity to the European theater, Soviet mobilizational capabilities, the size and scope of Soviet military reserves in terms of both manpower and material.

Although a conventional war would, in all likelihood, overwhelm Western Europe, the Alliance can legitimately aspire to deterring the Soviets from the belief that they could win a short conventional war in Europe. For example, the deployment of the FAR has been justified, in part, by the need to deal with Soviet development of operational maneuver groups (OMG).²⁷ OMGs are part of a shock attack strategy by the Soviets designed to overwhelm West Europe defenses.

Other French analysts tend to emphasize that the Soviets would plan to conduct nuclear strikes from the onset of a war in Europe. According to one such analyst, "The most reasonable hypothesis (for the beginning of a war) would be that of a nuclear attack conducted with highly accurate ballistic missiles capable of destroying from a distance the adversary's means of combat, especially catching them by surprise."²⁸ This judgment is bolstered by asserting that Soviet doctrine is based on nuclear warfighting as the basic military option for a European conflict.²⁹

Some French analysts are also concerned with the growing capability of the Soviets to implement a "flanking option" against Western Europe.³⁰ Soviet power projection forces could be used to threaten vital lines of supply in a crisis situation. Nuclear forces would not necessarily be useful in deterring Soviet actions in this regard. Rather, conventional forces coupled with good military and diplomatic relations with Third World supplying states (especially with the Arab Middle East) are critical to deterring the Soviets from attempting military flanking actions.

When French doctrine talks of deterrence, it is concerned primarily with the use of nuclear weapons in a massive strike against Soviet territory to deter Soviet military actions against France proper. The exercise of a flanking option by the Soviets against France by the use of conventional forces outside of Europe is not covered. Also, the

threat of massive strikes against the Soviet homeland might be undermined as the Soviets have developed more flexibility of conventional military means in Europe.

There are a number of technological developments by the Soviet military of great concern to the French which threaten the viability of French nuclear forces. First, the greater precision of Soviet nuclear warheads with lower yields (reducing collateral damage) provides the Soviets with an increasingly credible posture for conducting limited nuclear strikes against nuclear forces based in France.³¹ The Soviets would then have reduced France to its sea-based deterrent which might well enhance Soviet capability to dominate a war termination process with France.

Second, the growth in the capability of the Soviet air force--both in munitions and aircraft--provides them with the possibility of destroying all but the IRBMs with conventional ordnance.³² What would be a credible French response to such a Soviet conventional strike against French land-based nuclear forces?

Third, Soviet advances in anti-submarine warfare (ASW) might well undermine the credibility of the French sea-based deterrent. The heavy reliance by the French on the SSBN makes them especially concerned with the growth of the Soviet ASW threat. However, the French appear confident that the SSBN will remain a viable, second strike deterrent, for some time to come.³³

Fourth, significant Soviet breakthroughs in ballistic missile defense (BMD) would call into question the ability of French ballistic missile warheads to penetrate Soviet defenses. Soviet BMD breakthroughs coupled with Soviet advantages in passive defense and geographic expanse (as compared to France's very limited civil defense capability and limited geographical expanse) could erode the political will of France

to use nuclear weapons.³⁴ Why should France commit national suicide if she is only able to deliver a "slap in the face" rather than a fatal blow to the Soviets?

Fifth, the density and increasing quality of Soviet air defenses make it difficult for France easily to replace the ballistic missile warhead with air delivered weapons as the main strategic weapon. The French could develop increasingly longer-range standoff missiles but the more sophisticated guidance systems associated with U.S. ALCMs might well be beyond French technological grasp.³⁵

The variety of technological possibilities for Soviet military developments threaten in various ways the core of French strategic doctrine--independence, proportional deterrence and countervalue. Independence could be threatened by the growing need to cooperate with the U.S. or the U.K. in developing various aspects of strategic weapons technology (cruise missiles, submarines, etc.). Proportional deterrence could be undercut by dramatic improvements in Soviet strategic defense capabilities (against French systems prior to and after launch). The countervalue strategy could especially be undermined by a significant expansion of Soviet BMD capabilities.

The French position is challenged to a lesser extent by its allies, especially the U.S. and West Germany. The Americans challenge the French position in two major ways. First, the U.S., in developing its own military (especially strategic) technology, stimulates Soviet deployments which in turn are threatening to French systems.³⁶ If the Americans deploy BMD systems to protect their ICBMs, similar Soviet deployments would significantly undercut the credibility of the French deterrent. The development of U.S. cruise missile technology has encouraged the Soviets to enhance the capabilities of their air defenses to such an extent that the air-delivered alternative for France is not

an easy one by any means, especially when coupled with enhanced Soviet conventional attack capabilities against the French air force.

Second, the development by the U.S. of new conventional weapons technologies could foster change in NATO doctrine.³⁷ Such changes might imply the transformation of the "forward defense of West Germany" into a campaign to conduct conventional interdiction missions into Eastern Europe. Such a change in doctrine would seriously complicate French independence, especially with regard to defining the role of French tactical nuclear weapons as a "warning shot."

The West Germans challenge the French position in several ways. First, some politicians in West Germany have indicated that France should include its strategic forces in some way in the INF arms control process.³⁸

Second, West German officials wish France to contribute more fully and publically to the forward defense of Germany with French conventional forces.³⁹ These officials have been concerned that the current French economic downturn and commitment to nuclear modernization will lead to a reduction in French conventional capabilities in Europe. Consequently, West Germany might well use the formation of the FAR as an opportunity to deepen French commitment to long-term conventional modernization.

Third, West Germany will continue to pressure France to clarify its intentions with regard to the role of her tactical nuclear weapons. West Germany has always been understandably uneasy with the notion that French tactical nuclear weapons are to be used simply as an "advertisement" of French will to use strategic nuclear weapons. West Germany is concerned lest the French "advertisement" be translated into Soviet nuclear reprisal against NATO forces solely on German territory.

III. THE DILEMMA

The basic political purpose of French nuclear forces is to ensure French independence. The difficulty is that the growth in Soviet global military capabilities, the decline in Alliance cohesion, and the increased salience of West Germany to French security all question the meaning of independence if it is limited solely to the defense of French territory proper.

The growth in Soviet military capabilities undercuts the credibility of a French "all or nothing" strategy by allowing the Soviets the possibility of destroying French nuclear forces through conventional means. The Soviets also have the possibility of selective destruction of French nuclear forces--the prosecution of SSBNs at sea, air strikes against the French air force, and commando raids against the IRBMs. What would be the appropriate French response to selective and gradual disintegration of their nuclear forces in the face of Soviet conventional degradation of the deterrent?

The decline in Alliance cohesion increases the importance of France playing a significant role in strengthening the Alliance. If France refuses to commit its nuclear assets to any European role, then it can play that role only with its conventional forces. But if France starves conventional forces to feed nuclear ones, France will exacerbate intra-alliance relations, not strengthen them.

The relationship with West Germany might be the channel whereby France combines its national interests with broader Alliance concerns. Many things which would be perceived in France as illegitimate in dealing with the Americans appear to be legitimate in dealing with the Germans. France seeks a European role within the Alliance, not the revitalization of American leadership over Europe through the Alliance. However difficult the dialogue, the Franco-German security

relationship is at the heart of any Europeanization of the Alliance.⁴⁰ This dialogue is critical in terms of defining the missions of French conventional forces in Europe, in terms of solving critical military procurement problems, in terms of more efficient use of defense resources and of determining optimal military efficacy for the use of French tactical nuclear weapons. Even if French tactical nuclear weapons are conceived of as solely an "advertisement," the only actions which the Soviets might consider to be so are ones that would be militarily efficacious and meshed, however loosely, with the Alliance.

Nonetheless, to move beyond a commitment to national independence defined strictly in terms of using nuclear weapons to defend French territory might well erode the French defense consensus.⁴¹ The breadth of the consensus to deploy nuclear weapons is evident. The fragility is less so, but rests in the inability of French policy makers to directly confront the broader European concerns inextricably interconnected with the modernization of French nuclear forces. The erosion of the defense consensus by France trying to define a broader role for its nuclear weapons might well lead to a decreased commitment of the French public to defense and to reduced defense spending.

Hence, a central dilemma for French policymakers is between the need to expand the concept of independence to encompass greater interdependence within the Alliance and the need to maintain the myth that French territory is "sanctuarized" by the possession of nuclear weapons, this myth being central to the French defense consensus.

This dilemma will intensify as the Americans, Germans, and Russians each in their own way place greater pressure on France to "compromise" her independence. The Americans will hope that France will play a greater conventional role in augmenting the credibility of NATO's conventional deterrent. The Germans will hope that France will play a greater conventional role and recognize a role for its nuclear,

especially tactical, forces in the defense of Germany. The Soviets will insist that France (whether or not she wishes to recognize the fact) is playing a key role in the Alliance and her nuclear forces should certainly be counted as part of the Western deterrent.

The French for their part will continue to insist on the validity of their independent nuclear deterrent. The French dilemma arises from the reality that French forces are increasingly important to the credibility of Western defense efforts and to Soviet calculations in defining their approach to European security as well. There is no easy way for the French out of this dilemma.

IV. FRENCH DEFENSE OPTIONS FOR THE 1980s AND 1990s

How might France best resolve the tension between "independence" and "European security"? The French defense debate of the early 1980s has provided three major alternative responses to this difficult question.⁴²

First, France could "resolve" this tension by ignoring it. France would continue to emphasize the centrality of her nuclear forces to the defense of France proper. To the extent France made a contribution to European security it would be by indirectly supplementing the American nuclear "guarantee" in terms of the presence of an alternative decisionmaking center for nuclear reprisals against any Soviet nuclear attack directed toward France. To the extent that the Soviets could not conceive of fighting a war in the European theater without invading France, the "sanctuarization" of France by nuclear weapons contributes to deterrence.

There is a maximalist and minimalist version of this position. The maximalist version, espoused by some Gaullists, advocates a significant increase in the French strategic arsenal. The Gaullist party, the

Rassemblement pour la Republique (RPR), proposed an alternative military program law for the 1984-1988 period in which nine SSBNs would be operational by 1994.⁴³ It is difficult to see how such an augmentation could occur without a significant drawdown of French conventional forces. The maximalist position frequently carries with it a judgment concerning the non-utility of conventional forces in deterring the Soviets. The adversary is painted as planning a nuclear campaign against Europe, from which France could protect itself only with the possession of a secure second-strike strategic force.

The notion that strategic nuclear weapons "sanctuarize" France implies that West Germany must fend for herself. Some Gaullists have stated to the author that they would prefer to see West Germany occupied than to fire a single nuclear weapon in the defense of West Germany. As one Gaullist posed the question to the author, why should France commit national suicide to defend West Germany? Another Gaullist pointed out to the author that West Germany "fending for herself" could not include the acquisition by that country of nuclear weapons. This particular person would rather see Germany "Finlandized" than acquire an independent nuclear deterrent.

The minimalist position is the one espoused by the Parti Communiste Francais (PCF). As a member of the governing coalition, the PCF nominally agrees with the Parti Socialist Francais (PSF) on the "essentials" of French security policy. But as the recent annual summit (December 1983) between the PSF and PCF made clear, the agreement on "essentials" does not carry over to the "details" of concrete policy. The PCF supports a limited nuclear modernization as the absolute priority of French defense policy.⁴⁴ By starving conventional forces, the nuclear program reduces the power of the uniformed military, most notably the ground forces. Past struggles between the Left and the Army have not been forgotten by many members of the PCF. Paradoxically, the

PCF supports the nuclear policy as a way of reducing "militarism" in French society, rather than augmenting it.⁴⁵

A further strand of the minimalist version of "independence" has been espoused by some members of the left-wing of the PSF, notably the CERES group. The advantage of an independent nuclear deterrent for France is to allow France to avoid "entangling" alliances with the unreliable and erratic Americans. Also, by having an independent deterrent France does not have to "overcommit" resources to the military sector.

Both the maximalist and minimalist versions of "independence" have in common no change in French doctrine. The political purpose of French nuclear forces would be identified as solely the protection of French territory. The strength of this position is the preservation of the "historical" consensus which has emerged in France regarding nuclear weapons. The weakness of this position is the absence of any response to the erosion of the "public good" of Western defense. Although rational from the standpoint of French domestic considerations, such a position of "independence" would appear irresponsible to other members of the Western alliance in the challenging European security environment of the 1980s and 1990s.

Second, France could "resolve" the tension by not changing doctrine but augmenting the capabilities of France to participate in the forward defense of Germany by conventional means. Nuclear weapons would be used to protect French territory, primarily, and French "vital interests," secondarily. Ambiguity would surround exactly what is covered by the concept of "vital interests."

The current positions of the Mitterrand Administration embody this alternative.⁴⁶ French doctrine has clearly not changed under Mitterrand. The Administration has ritualistically asserted that French

doctrine has not been modified, in part, to allow changes in French military capability to unfold without a debilitating doctrinal debate, that is, a debate about the political implications of changing French military policy. The Administration has used the concept of "vital interests" to provide for a sense of ambiguity surrounding the political uses of French nuclear forces, especially tactical nuclear weapons.

The major alteration which the Administration has introduced in French forces is the rapid action force. It is clear that the creation of this force has been motivated by political objectives. The most significant one has been to enhance Franco-German security cooperation.⁴⁷ Defense Minister Hernu, as well as the newly appointed commander of the FAR, have gone so far as to identify the role of this force as that of having the capability of participating in the forward defense of Germany. This role would require close peacetime as well as wartime cooperation with NATO.⁴⁸

The government's new FAR has been the subject of vigorous discussion and criticism within France. Notably the government has been severely criticized for the changes in French doctrine which the deployment of the FAR seems to imply. During the all-night debate of December 2, 1983 in the French senate on the French defense budget witnessed by the author, several members of the opposition prominently displayed the newspaper article by the FAR commander suggesting a NATO role for this force. The mere appearance of such a role carries with it the air of illegitimacy to many Frenchmen.

The government has responded vigorously to the charge that the deployment of the FAR changes French doctrine. The government claims that all it is doing is creating more flexible deterrent options.⁴⁹ The force will be deployed in the south of France and would have to be moved northward to play its role. One government spokesman claims that such movement would provide an important "signal" to the Soviets of French intentions in a prewar setting, hence, adding to the range of French deterrent options.⁵⁰

The strength of this second option, "independence" plus "participation in the forward conventional defense" of West Germany, is the practical emphasis placed on altering capabilities, rather than on theological clarity. The Mitterrand Administration may well have set the objective of accelerating a process of security cooperation with West Germany which will then have a political logic of its own in 10-15 years. This process currently has two dimensions beyond the planned deployment of the FAR, namely, the bilateral security talks which are held biannually in full plenum and, more frequently, on the sub-group level, and the effort to expand Franco-German industrial cooperation, including armaments production.⁵¹

In other words, rather than debating the difficult problem of whether French nuclear weapons will ever be able to play an extended deterrence role for West Germany, why not focus on the practical dimensions of expanding Franco-German cooperation? The weakness of this position is that without doctrinal change at some point it will not be clear either to the French public or to France's allies that France is serious about a European role for its military forces. If France continues to value her nuclear forces much more than her conventional forces, the absence of some form of commitment of those nuclear forces to West Germany calls into question the seriousness with which France desires to play a European role.

Nonetheless, the Mitterrand Administration is clearly modifying the French concept of independence in defense policy. As a high-ranking French official noted in 1983, "It is often said that 'The policy of France is independent.' It would be better to say: 'The policy of France is as independent as possible.' Absolute independence does not exist any more in the realm of security than it does in the realm of economics."⁵²

There is a political force in France which would go further and make explicit the doctrinal changes necessary to identify clearly French conventional forces with the forward defense of Germany and with other Alliance military missions. The small political party of former President Giscard d'Estaing, the UDF, has clearly asserted the need for France to express its solidarity with the Alliance.⁵³ The UDF has criticized the Mitterrand Administration for overinvesting in nuclear forces. "The decision to give increased priority to nuclear arms, according to the government's own statements, in a reduced budget package is likely to produce a purely illusory 'sanctuarization' of defense whose inevitable result is neutralism in Europe and impotence in the world."⁵⁴ The former secretary general of the UDF even went so far as to speak of the French nuclear force as "a new Maginot line." Michel Pinton meant that nuclear forces are also self-detering and France needs robust conventional forces augmented by cooperation with the forces of the Alliance to protect French security interests.⁵⁵ Needless to say, there was a very vigorous negative public reaction to Pinton's turn of phrase.

A well-known advocate of greater cooperation in conventional forces with the Alliance, Francois de Rose, has articulated the problem of independence as follows:

It has often been said that France has a policy of independent defense. It would be more appropriate to say that France has an independent defense policy. The confusion is revealing, for an independent defense policy does not absolutely bar us from cooperating with our allies for common defense whereas an independent defense links it to neutrality.⁵⁶

Such a shift in the public characterization of the French defense effort is clearly required for a process of deepened conventional cooperation with the Alliance.

Third, France could assign her "independent" nuclear force a more ambitious role than simply deterring Soviet attacks against French territory, that is, a role greater than simply turning French national territory into a "sanctuary." Several augmentations of the role of French nuclear weapons have been suggested in recent years--the deployment of a large nuclear force armed with neutron warheads for battlefield use, the extension of some form of nuclear guarantee to West Germany, and the indirect or direct creation of some form of "European" nuclear force stimulated by French example and/or effort.

Some analysts have suggested that France ought to give her ground forces a significant upgrading of usable nuclear firepower. The most frequently discussed candidate for this role has been the neutron warhead.⁵⁷ If French forces were armed with an arsenal of neutron weapons, they would become a much more formidable barrier to any Soviet armored assault into Europe. By being prepared to take the nuclear battle to Soviet forces in the European theater, France would significantly enhance deterrence of Soviet "limited" war options. The mere existence of an anti-cities French nuclear capability is not enough to deter "limited" Soviet war aims.

A diversity of voices in France have suggested the possibility of extending some form of nuclear guarantee to West Germany. At the heart of such a guarantee is the question of the use of French tactical nuclear weapons.⁵⁸ Almost always the guarantee in question would be designed to supplement, not supplant the American nuclear guarantee. For example, Michel Tatu of Le Monde has argued that when the new Hades missile is ready for deployment it could be placed on German soil under a dual-key arrangement.⁵⁹ Also, in a speech delivered in Bonn, Jacques Chirac, Mayor of Paris and leader of the Gaullist party, argued that French nuclear forces should be involved in some form of a "European" guarantee to West German security.⁶⁰

Several variants of a "European" nuclear force idea have been aired in the recent past by French analysts.⁶¹ One variant emphasizes the importance of the simultaneous modernization of the French and British forces for European defense. The very fact that both forces will be augmented in the 1980s and 1990s enhances the nuclear protection for Europe.⁶² A second variant would go further and encourage direct British-French nuclear cooperation, either in joint development of their strategic forces or of a tactical nuclear force for Germany. One French analyst suggested to the author that a joint French-British cruise missile force could be developed for use in providing a "tactical nuclear cover" for French and British forces in West Germany. A third variant is much more ambitious and would seek to proliferate nuclear warheads among the major West European states, including West Germany.⁶³ This variant rests on the assumption that deterrence would be enhanced if the Soviets faced a multitude of nuclear decisionmaking centers. This variant would require, among other things, the abrogation of the nuclear nonproliferation treaty and dealing with the politically explosive issue of the possession of nuclear weapons by the West Germans.

The table below summarizes the basic French defense options for the 1980s and 1990s.

TABLE 1
FRENCH DEFENSE OPTIONS

Basic option	Variants	Military or security locus
1. Assert primacy of "independent" nuclear deterrent	- maximalist - minimalist	- SSBN force augmented - modest nuclear force modernization

TABLE 1 (Cont'd.)

Basic option	Variants	Military or security locus
2. "Independent" nuclear deterrent plus forward defense of FRG by conventional forces	<ul style="list-style-type: none"> - Franco-German co-operation - enhanced direct and public involvement by French conventional forces in Alliance missions 	<ul style="list-style-type: none"> - Nuclear modernization plus deployment of FAR - greater emphasis on enhancing NATO's conventional deterrence
3. "Independent" nuclear deterrent, plus	<ul style="list-style-type: none"> - enhanced tactical nuclear "battlefield" capability - supplemental nuclear guarantee for FRG - "European" nuclear force 	<ul style="list-style-type: none"> - neutron weapon - double-key system - enlarged sanctuary - indirect supplement - active Franco-British cooperation - Nuclear proliferation within Western Europe

In light of the various options "to resolve" the problem of defining the role of French nuclear weapons for West European defense, what are the most likely scenarios for the evolution of French defense policy and doctrine in the 1980s and 1990s?

The most likely scenario is the continued highest priority accorded to nuclear weapons with no doctrinal change affording a direct European defense role for French nuclear weapons. Precisely due to serious disagreement over doctrinal change, it is unlikely that doctrinal change will occur. But the absence of change in doctrine does not foreclose changes in capability. For example, the accretion of French strategic

power may foreshadow the modification of French countervalue doctrine to encompass some counterforce options.⁶⁴

Two debates over the development of the French nuclear force structure have a reasonable probability of occurring. The first debate would involve questioning the wisdom of placing too many of France's nuclear eggs in the ballistic missile basket. In light of perceived impending BMD deployments by the superpowers, no prudent French strategic planner can afford not to develop a serious non-ballistic missile alternative, most notably, the development of a cruise missile alternative. Especially significant might be the development of a sea-launched cruise missile program. The second debate would revolve around the tactical nuclear weapons issue. Some might wish to reduce the tactical component of the nuclear arsenal in order to augment the strategic component. Others might wish to "nuclearize" either the FAR or First Army by giving it a neutron warhead battlefield system. Others might wish to change the mix of tactical nuclear systems in favor either of the Hades or the ASMP programs.

The second most likely scenario is for a process of Franco-German military cooperation in conventional forces to unfold in the 1980s which would allow modifications in French doctrine to be made to include Germany directly in the French security concept. The most likely area where France would provide a "supplemental" nuclear guarantee for Germany would involve the tactical nuclear force. This could be done either by stationing some nuclear systems directly on German soil or by indicating the willingness to use tactical nuclear weapons based on French soil in the forward defense of Germany.

The least likely scenario is for France to reemphasize conventional forces at the expense of nuclear forces. Increased cooperation in the conventional area will be done to same extent for political purposes, the most important one being to anchor West Germany in the Western

security system. The major military purpose will be to enhance the deterrent capability of French conventional forces by increased cooperation within the alliance. Nonetheless, augmented cooperation will stop short of France rejoining the integrated NATO command, such an action being outside the pale of legitimacy in French politics.

In short, the modernization of her nuclear forces will remain the central priority for France. These weapons will, in most likelihood, remain identified with the defense of French territory, but there is increasing external pressure to define a broader role for these forces. There is internal debate regarding the legitimacy of providing a broader role for French nuclear weapons. This debate might just succeed in creating a "moving consensus" in favor of incorporating West Germany in the French security concept. But strong domestic pressures impede the evolution of such a consensus. Hence, it is very difficult for France to resolve its basic strategic dilemma.

FOOTNOTES

1. For an interesting recent discussion of the impact of nuclear weapons on alliance politics, see Charles Zorgbide, Les Alliances dans le Systeme Mondial (Paris: PUF, 1983), chapter nine.
2. For a discussion of the development of French doctrine see, "La Defense," in L'Etat et les Citoyens (Paris: Commission du Bilan la France, 1982), volume five, pp. 46-55. Also see Jean Klein, "La Strategie Nucleaire de la France et les Hypotheses de Guerre en France," Defense et Securite, 5, 1982, pp. 233-262.
3. See Lucien Poirier, Des Strategies Nucleaires (Paris: Hachette, 1977), chapter fifteen.
4. See Lucien Poirer, Essais de Strategie Theorique (Paris: Strategique, 1982), pp. 287-311.
5. See Dominique Moisi, "Les Limites du Consensus," in Pierre Lellouche, ed., Pacifisme et Dissuasion (Paris: Economica, 1983), pp. 253-266.
6. See Pierre Lacoste, Strategie Navale (Paris: Fernand Nathan, 1981), p. 294.
7. See the various policy declarations of the Giscard d'Estaing Administration contained in Une Politique de Defense pour la France (Paris, 1981).
8. See Washington Post, June 10, 1983, p 12; New York Times, June 9, 1983, p. A-11.
9. Pascal Krop, Les Socialistes et l'Armee (Paris: PUF, 1983), p. 148.
10. Mancur Olson, The Logic of Collective Action (Cambridge, Mass.: Harvard University Press, 1965).
11. This idea was suggested to me by Robert Gelbard of the United States Department of State and is acknowledged with his permission.
12. On Franco-German military cooperation, see Walter Schutze, "La Cooperation Franco-Allemande dans le Domaine Militaire," in Allemagne d'Aujourd'hui, number 84.
13. See Michael M. Harrison, The Reluctant Ally: France and Atlantic Security (Baltimore: The Johns Hopkins University Press, 1981), pp. 193-204.
14. General Lacaze, "Politique de Defense et Strategie Militaire de la France," Defense Nationale (June 1983), p. 16.

FOOTNOTES (Cont'd.)

15. Daily Report: Western Europe, October 22, 1982, p. J-2.
16. See Joseph Rovon, "Bonn," Politique Internationale, Spring, 1982, pp. 43-66.
17. Le Monde, June 1 and June 18, 1983.
18. On the importance of declaratory ambiguity to dissuasion, see Dominique David, "L'Alliance: Notre Arche et son Deluge," Strategique, No. 16, p. 83.
19. Livre Blanc sur la Defense Nationale (Paris, 1972).
20. This has been most clearly stated by Giscard d'Estaing's political party, the Union pour la Democratie Francaise, in Une Doctrine de Defense Pour la France (Paris, May 1980).
21. Daily Report: Western Europe, June 28, 1983, p. K-1.
22. See Maurice Leman, "Les Neutrons: l'Arme Anti-Invasion pour une Defense Europeenne," Politique Etrangere, 2, 1981, pp. 409-426.
23. Pascal Krop, Le Matin, March 13, 1982.
24. Le Point, November 30, 1981, pp. 58-65.
25. Der Spiegel, October 18, 1982, pp. 31-32.
26. See Defense Nationale, March 1982, p. 58. See also the report by Senator M. Jacques Chaumont entitled Defense: Forces Terrestres (Paris: Senat, November 21, 1983).
27. Liberation, June 18-19, 1983.
28. Charles Zorgbide, Le Risque de Guerre (Paris: PUF, 1981), p. 91.
29. See Henri Paris, Strategies Sovietique et Americaine (Paris: Strategique, 1980), p. 69.
30. See Jean-Paul Pigasse, Le Bouclier d'Europe (Paris: Seghers, 1982), p. 57.
31. See General Gallois, "L'Option Zero est Inacceptable pour l'Europe," Geopolitique (April 1983), pp. 104-112. Gallois has elaborated his argument in "Precision, the Fourth Age of Strategy," unpublished paper, November 1983.

FOOTNOTES (Cont'd.)

32. On the problem of the threat posed to France by the Soviet Air Force see the report by M. Albert Voilquin entitled Les Moyens de la Defense Aerienne (Paris: Senat, April 20, 1983).
33. See Hubert Moineville, La Guerre Navale (Paris: PUF, 1982), pp. 54-55.
34. For controversial treatment of the BMD problem see Marc Geneste and Arnold Kramish, "De la Terreur a la Defense: Le Changement de Parapluie," Defense Nationale, January 1984, pp. 35-52.
35. See Lawrence Freedman, "The European Nuclear Powers: Britain and France," in Richard K. Betts, editor, Cruise Missiles (Washington, D.C.: Brookings, 1981), pp. 464-476.
36. See articles by Jean-Paul Pigasse, Defense et Securite, April 20, April 28, and May 1, 1983.
37. The tension between changing American doctrine and the traditional French position on defense is evident in Defense and Arms Control Policies in the 1980s (New York: Trilateral Commission, 1983), Triangle Paper, no. 26, pp. 66-67, 90, 103-104. On changing American doctrine and its possible impact on France see La Nouvelle Doctrine de Guerre Americaine et la Securite de l'Europe (Paris: Centre Interdisciplinaire de Recherches sur la Paix et d'Etudes Strategiques, 1983), Cahiers d'Etudes Strategiques, no. 1.
38. Karsten Voigt and Egon Bahr of the SPD are among the most prominent representatives of this point of view.
39. See Konrad Seitz, "La Cooperation Franco-Allemande dans le Domaine de la Politique de Securite," Politique Etrangere, 4, 1982, pp. 979-987.
40. See Bernard Adrien (Pseudonym), "La France et les Interrogations Allemandes," Politique Etrangere, 4, 1982, pp. 967-977.
41. On the fragility of the French defense consensus see Pierre Lellouche, "France and the Euromissiles," Foreign Affairs, Winter 1983-84, pp. 318-334.
42. This section is based in part on extensive interviews conducted by the author in Paris in May and December 1983. The author would like to thank the Institut Francaise des Relations Internationale for its help.
43. Contre-Projet de Loi de Progamation Militaire, 1984-1988 (Paris: RPR, 1983).

FOOTNOTES (Cont'd.)

44. On the PCF's nuclear policy, see Nicole Gnesotto, "Le PCF et les Euromissiles," Politique Etrangere, 3, 1983, pp. 701-711.
45. On the relationship between the PCF and the military, see Yves Roucaute, Le PCF et l'Armee (Paris: PUF, 1983).
46. For an interesting statement of the Administration's position by an informal participant, see Jacques Huntzinger, "Defense de la France, Securite de l'Europe," Politique Etrangere, 2, 1983, pp. 395-402.
47. See the column by Rowland Evans and Robert Novak, "Mitterrand Looks to Germany," Washington Post, December 16, 1983.
48. See Olivier Wormser, "Quelle Politique de Defense?" L'Express, December 9-15, 1983, p. 25.
49. See the arguments by Hernu in Le Monde, October, 25, 1983.
50. Francois Cailleteau, "La Force d'Action Rapide," Etudes Polemologiques, Bulletin no. 3, 1983, p. 5.
51. On the general significance of European armaments production to the Mitterrand Administration, see the speech by Defense Minister Hernu delivered to the West European Assembly, December 1, 1983, unpublished draft text obtained from the French Ministry of Defense.
52. As quoted in Dominique de Montvalon, "France-Otan: la Fin des Soupcons," L'Express, June 10-16, 1983, p. 94.
53. Une Doctrine de Defense pour la France; La Loi de Programmation Militaire Necessaire a la France en 1983 (Paris: UDF, April 1983).
54. Le Monde, April 20, 1983.
55. Le Monde, June 16, 1983.
56. Francois de Rose, "La Defense de la France et de l'Europe," Defense Nationale, December 1982, p. 73. See also de Rose's new book, Contre la Strategie des Curiaces (Paris: Julliard, 1983).
57. The best known proponent of this idea is Marc Geneste. See Samuel T. Cohn and Marc Geneste, Echec a la Guerre: La Bombe a Neutrons (Paris: Editions Copernic, 1980); Marc Geneste, "Why the Allies need the Neutron Bomb," Wall Street Journal, August 17, 1983, p. 23.

FOOTNOTES (Cont'd.)

58. See Pierre Eylau-Wagram (Pseudonym), "Propositions pour une Strategie Francaise de 1980 a 1990," Politique Etrangere, 1, 1981, pp. 121-136.
59. Le Monde, December 4-5, 1983.
60. Le Monde, October 28, 1983.
61. For an overview of this problem, see Jean Klein, "Myths et Realites de la Defense de l'Europe," Politique Etrangere, 2, 1983, pp. 315-336.
62. See the interview of General Gallois in Liberation, October 19, 1983.
63. See Michel Manel, L'Europe sans Defense (Paris: Berger-Levrault, 1982). This book was reissued in 1983 under a new title, L'Europe face aux SS-20.
64. On the changing French force structure, see Robbin F. Laird, "French Nuclear Forces in the 1980s and 1990s," Comparative Strategy, forthcoming.

CNA PROFESSIONAL PAPERS - 1978 TO PRESENT*

- PP 211
Mizrahi, Maurice M., "On Approximating the Circular Coverage Function," 14 pp., Feb 1978, AD A054 429
- PP 212
Mangel, Marc, "On Singular Characteristic Initial Value Problems with Unique Solution," 20 pp., Jun 1978, AD A058 535
- PP 213
Mangel, Marc, "Fluctuations in Systems with Multiple Steady States. Application to Lankester Equations," 12 pp., Feb 78 (Presented at the First Annual Workshop on the Information Linkage Between Applied Mathematics and Industry, Naval PG School, Feb 23-25, 1978), AD A071 472
- PP 214
Weinland, Robert G., "A Somewhat Different View of The Optimal Naval Posture," 37 pp., Jun 1978 (Presented at the 1976 Convention of the American Political Science Association (APSA/IUS Panel on "Changing Strategic Requirements and Military Posture"), Chicago, Ill., September 2, 1976), AD A056 228
- PP 215
Collie, Russell C., "Comments on: Principles of Information Retrieval by Manfred Kochen," 10 pp., Mar 78 (Published as a Letter to the Editor, Journal of Documentation, Vol. 31, No. 4, pages 298-301), December 1975), AD A054 426
- PP 216
Collie, Russell C., "Lotka's Frequency Distribution of Scientific Productivity," 18 pp., Feb 1978 (Published in the Journal of the American Society for Information Science, Vol. 28, No. 6, pp. 366-370, November 1977), AD A054 425
- PP 217
Collie, Russell C., "Bibliometric Studies of Scientific Productivity," 17 pp., Mar 78 (Presented at the Annual meeting of the American Society for Information Science held in San Francisco, California, October 1976), AD A054 442
- PP 218 - Classified
- PP 219
Huntzinger, R. LaVar, "Market Analysis with Rational Expectations: Theory and Estimation," 60 pp., Apr 78, AD A054 422
- PP 220
Maurer, Donald E., "Diagonalization by Group Matrices," 26 pp., Apr 78, AD A054 443
- PP 221
Weinland, Robert G., "Superpower Naval Diplomacy in the October 1973 Arab-Israeli War," 76 pp., Jun 1978 (Published in Seapower in the Mediterranean: Political Utility and Military Constraints, The Washington Papers No. 61, Beverly Hills and London: Sage Publications, 1979) AD A055 564
- PP 222
Mizrahi, Maurice M., "Correspondence Rules and Path Integrals," 30 pp., Jun 1978 (Invited paper presented at the CNRS meeting on "Mathematical Problems in Feynman's Path Integrals," Marseille, France, May 22-26, 1978) (Published in Springer Verlag Lecture Notes in Physics, 106, (1979), 234-253) AD A055 536
- PP 223
Mangel, Marc, "Stochastic Mechanics of Molecule-Molecule Reactions," 21 pp., Jun 1978, AD A056 227
- PP 224
Mangel, Marc, "Aggregation, Bifurcation, and Extinction in Exploited Animal Populations," 48 pp., Mar 1978, AD A058 536
*Portions of this work were started at the Institute of Applied Mathematics and Statistics, University of British Columbia, Vancouver, B.C., Canada
- PP 225
Mangel, Marc, "Oscillations, Fluctuations, and the Hopf Bifurcation," 43 pp., Jun 1978, AD A058 537
*Portions of this work were completed at the Institute of Applied Mathematics and Statistics, University of British Columbia, Vancouver, Canada.
- PP 226
Raiston, J. M. and J. W. Mann, "Temperature and Current Dependence of Degradation in Red-Emitting GaP LEDs," 34 pp., Jun 1978 (Published in Journal of Applied Physics, 50, 3630, May 1979) AD A058 538
*Bell Telephone Laboratories, Inc.
- PP 227
Mangel, Marc, "Uniform Treatment of Fluctuations at Critical Points," 50 pp., May 1978, AD A058 539
- PP 228
Mangel, Marc, "Relaxation at Critical Points: Deterministic and Stochastic Theory," 54 pp., Jun 1978, AD A058 540
- PP 229
Mangel, Marc, "Diffusion Theory of Reaction Rates, I: Formulation and Einstein-Smoluchowski Approximation," 50 pp., Jan 1978, AD A058 541
- PP 230
Mangel, Marc, "Diffusion Theory of Reaction Rates, II Ornstein-Uhlenbeck Approximation," 34 pp., Feb 1978, AD A058 542
- PP 231
Wilson, Desmond P., Jr., "Naval Projection Forces: The Case for a Responsive MAF," Aug 1978, AD A054 543
- PP 232
Jacobson, Louis, "Can Policy Changes Be Made Acceptable to Labor?" Aug 1978 (Submitted for publication in Industrial and Labor Relations Review), AD A061 528

*CNA Professional Papers with an AD number may be obtained from the National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia 22151. Other papers are available from the Management Information Office, Center for Naval Analysis, 2000 North Beauregard Street, Alexandria, Virginia 22311. An Index of Selected Publications is also available on request. The Index includes a Listing of Professional Papers; with abstracts; issued from 1969 to June 1981.

- PP 233
Jacobson, Louis, "An Alternative Explanation of the Cyclical Pattern of Quits," 23 pp., Sep 1978
- PP 234 - Revised
Jondrow, James and Levy, Robert A., "Does Federal Expenditure Displace State and Local Expenditure: The Case of Construction Grants," 23 pp., Oct 1979, AD A061 529
- PP 235
Mizrahi, Maurice M., "The Semiclassical Expansion of the Anharmonic-Oscillator Propagator," 41 pp., Oct 1978 (Published in Journal of Mathematical Physics 20 (1979) pp. 844-855), AD A061 538
- PP 237
Maurer, Donald, "A Matrix Criterion for Normal Integral Bases," 10 pp., Jan 1979 (Published in the Illinois Journal of Mathematics, Vol. 22 (1978), pp. 672-681)
- PP 238
Utgoft, Kathleen Classen, "Unemployment Insurance and The Employment Rate," 20 pp., Oct 1978 (Presented at the Conference on Economic Indicators and Performance: The Current Dilemma Facing Government and Business Leaders, presented by Indiana University Graduate School of Business), AD A061 527
- PP 239
Trost, R. P. and Warner, J. T., "The Effects of Military Occupational Training on Civilian Earnings: An Income Selectivity Approach," 38 pp., Nov 1979k, AD A077 831
- PP 240
Powers, Bruce, "Goals of the Center for Naval Analyses," 13 pp., Dec 1978, AD A063 759
- PP 241
Mangel, Marc, "Fluctuations at Chemical Instabilities," 24 pp., Dec 1978 (Published in Journal of Chemical Physics, Vol. 69, No. 8, Oct 15, 1978), AD A063 787
- PP 242
Simpson, William R., "The Analysis of Dynamically Interactive Systems (Air Combat by the Numbers)," 160 pp., Dec 1978, AD A063 760
- PP 243
Simpson, William R., "A Probabilistic Formulation of Murphy Dynamics as Applied to the Analysis of Operational Research Problems," 18 pp., Dec 1978, AD A063 761
- PP 244
Sherman, Allen and Horowitz, Stanley A., "Maintenance Costs of Complex Equipment," 20 pp., Dec 1978 (Published By The American Society of Naval Engineers, Naval Engineers Journal, Vol. 91, No. 6, Dec 1979) AD A071 473
- PP 245
Simpson, William R., "The Accelerometer Methods of Obtaining Aircraft Performance from Flight Test Data (Dynamic Performance Testing)," 403 pp., Jun 1979, AD A075 226
- PP 246
Brechling, Frank, "Layoffs and Unemployment Insurance," 35 pp., Feb 1979 (Presented at the Nber Conference on "Low Income Labor Markets," Chicago, Jun 1978), AD A096 629
- PP 248
Thomas, James A., Jr., "The Transport Properties of Dilute Gases in Applied Fields," 183 pp., Mar 1979, AD A096 464
- PP 249
Glasser, Kenneth S., "A Secretary Problem with a Random Number of Choices," 23 pp., Mar 1979
- PP 250
Mangel, Marc, "Modeling Fluctuations in Macroscopic Systems," 26 pp., Jun 1979
- PP 251
Trost, Robert P., "The Estimation and Interpretation of Several Selectivity Models," 37 pp., Jun 1979, AD A075 941
- PP 252
Nunn, Walter R., "Position Finding with Prior Knowledge of Covariance Parameters," 5 pp., Jun 1979 (Published in IEEE Transactions on Aerospace & Electronic Systems, Vol. AES-15, No. 3, Mar 1979)
- PP 253
Glasser, Kenneth S., "The d-Choice Secretary Problem," 32 pp., Jun 1979, AD A075 225
- PP 254
Mangel, Marc and Quanbeck, David B., "Integration of a Bivariate Normal Over an Offset Circle," 14 pp., Jun 1979, AD A096 471
- PP 255 - Classified, AD 8051 441L
- PP 256
Maurer, Donald E., "Using Personnel Distribution Models," 27 pp., Feb 1980, AD A082 218
- PP 257
Theiler, R., "Discounting and Fiscal Constraints: Why Discounting is Always Right," 10 pp., Aug 1979, AD A075 224
- PP 258
Mangel, Marc S. and Thomas, James A., Jr., "Analytical Methods in Search Theory," 86 pp., Nov 1979, AD A077 832
- PP 259
Glass, David V.; Hsu, Ih-Ching; Nunn, Walter R., and Perin, David A., "A Class of Commutative Markov Matrices," 17 pp., Nov 1979, AD A077 833
- PP 260
Mangel, Marc S. and Cope, Davis K., "Detection Rate and Sweep Width in Visual Search," 14 pp., Nov 1979, AD A077 834
- PP 261
Villa, Carlos L.; Zvijac, David J. and Ross, John, "Frank-Condon Theory of Chemical Dynamics. VI. Angular Distributions of Reaction Products," 14 pp., Nov 1979 (Reprinted from Journal Chemical Phys. 70(12), 15 Jun 1979), AD A076 287
- PP 262
Petersen, Charles C., "Third World Military Elites in Soviet Perspective," 50 pp., Nov 1979, AD A077 835
- PP 263
Robinson, Kathy L., "Using Commercial Tankers and Container-ships for Navy Underway Replenishment," 25 pp., Nov 1979, AD A077 836

- PP 264
Weinland, Robert G., "The U.S. Navy in the Pacific: Past, Present, and Glimpses of the Future," 31 pp., Nov 1979 (Delivered at the International Symposium on the Sea, sponsored by the International Institute for Strategic Studies, The Brookings Institution and the Yomiuri Shimbun, Tokyo, 16-20 Oct 1978) AD A066 837
- PP 265
Weinland, Robert G., "War and Peace in the North: Some Political Implications of the Changing Military Situation in Northern Europe," 18 pp., Nov 1979 (Prepared for presentation to the Conference of the Nordic Balance in Perspective: The Changing Military and Political Situation," Center for Strategic and International Studies, Georgetown University, Jun 15-16, 1978) AD A077 838
- PP 266
Utgoff, Kathy Classen, and Brechling, Frank, "Taxes and Inflation," 25 pp., Nov 1979, AD A081 194
- PP 267
Trost, Robert P., and Vogel, Robert C., "The Response of State Government Receipts to Economic Fluctuations and the Allocation of Counter-Cyclical Revenue Sharing Grants," 12 pp., Dec 1979 (Reprinted from the Review of Economics and Statistics, Vol. LXI, No. 3, August 1979)
- PP 268
Thomson, James S., "Seaport Dependence and Inter-State Cooperation: The Case of Sub-Saharan Africa," 141 pp., Jan 1980, AD A081 193
- PP 269
Weiss, Kenneth G., "The Soviet Involvement in the Ogaden War," 42 pp., Jan 1980 (Presented at the Southern Conference on Slavic Studies in October, 1979), AD A082 219
- PP 270
Remnek, Richard, "Soviet Policy in the Horn of Africa: The Decision to Intervene," 52 pp., Jan 1980 (To be published in "The Soviet Union in the Third World: Success or Failure," ed. by Robert M. Donaldson, Westview Press, Boulder, Co., Summer 1980), AD A081 195
- PP 271
McConnell, James, "Soviet and American Strategic Doctrines: One More Time," 43 pp., Jan 1980, AD A081 192
- PP 272
Weiss, Kenneth G., "The Azores in Diplomacy and Strategy, 1940-1945," 46 pp., Mar 1980, AD A085 094
- PP 273
Nakada, Michael K., "Labor Supply of Wives with Husbands Employed Either Full Time or Part Time," 39 pp., Mar 1980, AD A082 220
- PP 274
Nunn, Walter R., "A Result in the Theory of Spiral Search," 9 pp., Mar 1980
- PP 275
Goldberg, Lawrence, "Recruiters Advertising and Navy Enlistments," 34 pp., Mar 1980, AD A082 221
- PP 276
Goldberg, Lawrence, "Delaying an Overhaul and Ship's Equipment," 40 pp., May 1980, AD A085 095
- PP 277
Mangel, Marc, "Small Fluctuations in Systems with Multiple Limit Cycles," 19 pp., Mar 1980 (Published in SIAM J. Appl. Math., Vol. 38, No. 1, Feb 1980) AD A086 229
- PP 278
Mizrahi, Maurice, "A Targeting Problem: Exact vs. Expected-Value Approaches," 23 pp., Apr 1980, AD A085 096
- PP 279
Walt, Stephen M., "Causal Inferences and the Use of Force: A Critique of Force Without War," 50 pp., May 1980, AD A085 097
- PP 280
Goldberg, Lawrence, "Estimation of the Effects of A Ship's Steaming on the Failure Rate of Its Equipment: An Application of Econometric Analysis," 25 pp., Apr 1980, AD A085 098
- PP 281
Mizrahi, Maurice M., "Comment on 'Discretization Problems of Functional Integrals in Phase Space'," 2 pp., May 1980, published in "Physical Review D", Vol. 22 (1980), AD A094 994
- PP 283
Dismukes, Bradford, "Expected Demand for the U.S. Navy to Serve as An Instrument of U.S. Foreign Policy: Thinking About Political and Military Environmental Factors," 30 pp., Apr 1980, AD A085 099
- PP 284
J. Kellison,* W. Nunn, and U. Sumita,** "The Laguerre Transform," 119 pp., May 1980, AD A085 100
*The Graduate School of Management, University of Rochester and the Center for Naval Analyses
**The Graduate School of Management, University of Rochester
- PP 285
Remnek, Richard B., "Superpower Security Interests in the Indian Ocean Area," 26 pp., Jun 1980, AD A087 113
- PP 286
Mizrahi, Maurice M., "On the WKB Approximation to the Propagator for Arbitrary Hamiltonians," 25 pp., Aug 1980 (Published in Journal of Math. Phys., 22(1) Jan 1981), AD A091 307
- PP 287
Cope, Davis, "Limit Cycle Solutions of Reaction-Diffusion Equations," 35 pp., Jun 1980, AD A087 114
- PP 288
Golman, Walter, "Don't Let Your Slides Flip You: A Painless Guide to Visuals That Really Aid," 28 pp., (revised Aug 1982), AD A092 732
- PP 289
Robinson, Jack, "Adequate Classification Guidance - A Solution and a Problem," 7 pp., Aug 1980, AD A091 212
- PP 290
Watson, Gregory H., "Evaluation of Computer Software in an Operational Environment," 17 pp., Aug 1980, AD A091 213
- PP 291
Meddala, G. S.* and Trost, R. P., "Some Extensions of the Marlove Press Model," 17 pp., Oct 1980, AD A091 946
*University of Florida

- PP 292
Thomas, James A., Jr., "The Transport Properties of Binary Gas Mixtures in Applied Magnetic Fields," 10 pp., Sep 1980 (Published in Journal of Chemical Physics 72(10), 15 May 1980)
- PP 293
Thomas, James A., Jr., "Evaluation of Kinetic Theory Collision Integrals Using the Generalized Phase Shift Approach," 12 pp., Sep 1980 (Printed in Journal of Chemical Physics 72(10), 15 May 1980)
- PP 294
Roberts, Stephen S., "French Naval Policy Outside of Europe," 30 pp., Sep 1980 (Presented at the Conference of the Section on Military Studies, International Studies Association, Kilauea Island, S.C.), AD A091 306
- PP 295
Roberts, Stephen S., "An Indicator of Informal Empire: Patterns of U.S. Navy Cruising on Overseas Stations, 1869-1897," 40 pp., Sep 1980 (Presented at Fourth Naval History Symposium, US Naval Academy, 26 Oct 1979), AD A091 316
- PP 296
Dismukes, Bradford, and Petersen, Charles C., "Maritime Factors Affecting Iberian Security," (Factores Maritimos que Afectan la Seguridad Iberica) 14 pp., Oct 1980, AD A092 733
- PP 297 - Classified
- PP 298
Mizrahi, Maurice M., "A Markov Approach to Large Missile Attacks," 31 pp., Jan 1981, AD A096,159
- PP 299
Jondrow, James M., and Levy, Robert A., "Wage Leadership in Construction," 19 pp., Jan 1981, AD A094 797
- PP 300
Jondrow, James, and Scheldt, Peter,* "On the Estimation of Technical Inefficiency in the Stochastic Frontier Production Function Model," 11 pp., Jan 1981, AD A096 160
*Michigan State University
- PP 301
Jondrow, James M.; Levy, Robert A.; and Hughes, Claire, "Technical Change and Employment in Steel, Autos, Aluminum, and Iron Ore," 17 pp., Mar 1981, AD A099 394
- PP 302
Jondrow, James M., and Levy, Robert A., "The Effect of Imports on Employment Under Rational Expectations," 19 pp., Apr 1981, AD A099 392
- PP 303
Thomson, James, "The Rarest Commodity in the Coming Resource Wars," 3 pp., Aug 1981 (Published in the Washington Star, 13 Apr 1981), AD A104 221
- PP 304
Duffy, Michael K.; Greenwood, Michael J.;* and McDowell, John M.,** "A Cross-Sectional Model of Annual Interregional Migration and Employment Growth: Intertemporal Evidence of Structural Change, 1958-1975," 31 pp., Apr 1981, AD A099 393
*University of Colorado
**Arizona State University
- PP 305
Nunn, Laura M., "An Introduction to the Literature of Search Theory," 32 pp., Jun 1981, AD A100 420
- PP 306
Anger, Thomas E., "What Good Are Warfare Models?" 7 pp., May 1981, AD A100 421
- PP 307
Thomson, James, "Dependence, Risk, and Vulnerability," 43 pp., Jun 1981, AD A102 698
- PP 308
Mizrahi, M.M., "Correspondence Rules and Path Integrals," 17 pp., Jul 1981. (Published in "Nuovo Cimento B", Vol. 61, 1981), AD A102 699
- PP 309
Weinland, Robert G., "An (The?) Explanation of the Soviet Invasion of Afghanistan," 44 pp., May 1981, AD A100 422
- PP 310
Stanford, Janette M., and Wu, Tai Te,* "A Predictive Method for Determining Possible Three-dimensional Foldings of Immunoglobulin Backbones Around Antibody Combining Sites," 19 pp., Jun 1981 (Published in J. Theor. Biol., 1981), 88, AD A100 423
*Northwestern University
- PP 311
Bowes, Marianne, Brechling, Frank P. R.; and Utgoff, Kathleen P. Classen, "An Evaluation of UI Funds," 13 pp., May 1981 (Published in National Commission on Unemployment Compensation's "Unemployment Compensation: Studies and Research," Volume 2, Jul 1980), AD A100 424
- PP 312
Jondrow, James; Bowes, Marianne; and Levy, Robert, "The Optimum Speed Limit," 23 pp., Jul 1983 (Revised), AD A100 425
- PP 313
Roberts, Stephen S., "The U.S. Navy in the 1980s," 36 pp., Jul 1981, AD A102 696
- PP 314
Jehn, Christopher; Morowitz, Stanley A.; and Lockman, Robert F., "Examining the Draft Debate," 20 pp., Jul 1981, AD A106 192
- PP 315
Buck, Ralph V. (Capt., USN), "Le Catastrophe by any other name....," 4 pp., Jul 1981, AD A102 697
- PP 316
Roberts, Stephen S., "Western European and NATO Navies, 1980," 20 pp., Aug 1981, AD A104 223
- PP 317
Roberts, Stephen S., "Superpower Naval Crisis Management in the Mediterranean," 35 pp., Aug 1981, AD A104 222
- PP 318
Vego, Milan M., "Yugoslavia and the Soviet Policy of Force in the Mediterranean Since 1961," 187 pp., Aug 1981

- PP 319
Smith, Michael W., "Anti-Air Warfare Defense of Ships at Sea," 46 pp., Sep 1981 (This talk was delivered at the Naval Warfare System and Technology Conference of the American Institute of Aeronautics and Astronautics in Washington on 12 Dec 1980; in Boston on 20 Jan 1981; and in Los Angeles on 12 Jun 1981.), AD A106 191
- PP 320
Trost, R. P.; Lurie, Philip; and Berger, Edward, "A Note on Estimating Continuous Time Decision Models," 15 pp., Sep 1981, AD A106 193
- PP 321
Duffy, Michael K., and Ladman, Jerry R., "The Simultaneous Determination of Income and Employment in United States--Mexico Border Region Economies," 34 pp., Sep 1981, AD A106 340
*Associate Professor of Economics, Arizona State University
- PP 322
Warner, John T., "Issues in Navy Manpower Research and Policy: An Economist's Perspective," 66 pp., Dec 1981, AD A110 221
- PP 323
Bosse, Frederick W., "Generation of Correlated Log-Normal Sequences for the Simulation of Clutter Echoes," 33 pp., Dec 1981
- PP 324
Horowitz, Stanley A., "Quantifying Seapower Readiness," 6 pp., Dec 1981 (Published in Defense Management Journal, Vol. 18, No. 2), AD A110 220
- PP 326
Roberts, Stephen S., "Western European and NATO Navies, 1981," 27 pp., Jul 1982, AD A118 703
- PP 327
Hammon, Colin (Capt., USN), and Graham, David R., "Estimation and Analysis of Navy Shipbuilding Program Disruption Costs," 12 pp., Mar 1980, AD A112 514
- PP 328
Weinland, Robert G., "Northern Waters: Their Strategic Significance," 27 pp., Dec 1980, AD A112 509
- PP 329
Mangel, Marc, "Applied Mathematicians And Naval Operators," 40 pp., Mar 1982 (Revised), AD A116 598
- PP 330
Lockman, Robert F., "Alternative Approaches to Attrition Management," 30 pp., Jan 1982, AD A112 510
- PP 331
Roberts, Stephen S., "The Turkish Straits and the Soviet Navy in the Mediterranean," 15 pp., Mar 1982 (Published in Navy International)
- PP 332
Jehn, Christopher, "The RDF and Amphibious Warfare," 36 pp., Mar 1982, AD A113 592
- PP 333
Lee, Lung-Fel,* and Trost, Robert P., "Estimation of Some Limited Dependent Variable Models with Application to Housing Demand," 26 pp., Jan 1982. (Published in Journal of Econometrics 8 (1978), AD A 112 536
*University of Minnesota
- PP 334
Kenny, Lawrence W.;* Lee, Lung-Fel;** Maddala, G. S.;* and Trost R. P., "Returns to College Education: An Investigation of Self-Selection Bias Based on the Project Talent Data," 15 pp., Jan 1982. (Published in International Economic Review, Vol. 20, No. 3, Oct 1979), AD A112 480
*University of Florida
**University of Minnesota
- PP 335
Lee, Lung-Fel;* Maddala, G. S.;** and Trost, R.P. "Asymptotic Covariance Matrices of Two-Stage Probit and Two-Stage Tobit Methods for Simultaneous Equations Models with Selectivity," 13 pp., Jan 1982. (Published in Econometrica, Vol. 48, No. 2, Mar 1980), AD A112 483
*University of Minnesota
**University of Florida
- PP 336
O'Neill, Thomas, "Mobility Fuels for the Navy," 13 pp., Jan 1982. (Accepted for publication in Naval Institute Proceedings), AD A112 511
- PP 337
Warner, John T., and Goldberg, Matthew S., "The Influence of Non-Pecuniary Factors on Labor Supply: The Case of Navy Enlistment Personnel," 23 pp., Dec 1981, AD A113 094
- PP 339
Wilson, Desmond P., "The Persian Gulf and the National Interest," 11 pp., Feb 1982, AD A112 505
- PP 340
Lurie, Philip; Trost, R. P.; and Berger, Edward, "A Method for Analyzing Multiple Spell Duration Data," 34 pp., Feb 1982, AD A112 504
- PP 341
Trost, Robert P., and Vogel, Robert C.,* "Prediction with Pooled Cross-Section and Time-Series Data: Two Case Studies," 6 pp., Feb 1982, AD A112 503
*Southern Illinois University
- PP 342
Lee, Lung-Fel;* Maddala, G. S.;** and Trost, R. P., "Testing for Structural Change by O-Methods in Switching Simultaneous Equations Models," 5 pp., Feb 1982, AD A112 482
*University of Minnesota
**University of Florida
- PP 343
Goldberg, Matthew S., "Projecting the Navy Enlisted Force Level," 9 pp., Feb 1982, AD A112 484
- PP 344
Fletcher, Jean, W., "Navy Quality of Life and Reenlistment," 13 pp., Nov 1981, AD A113 095

- PP 345
Uttoff, Kathy, and Thaler, Dick, "The Economics of Multi Year Contracting," 47 pp., Mar 1982. (Presented at the 1982 Annual Meeting of the Public Choice Society, San Antonio, Texas, 5-7 Mar 1982), AD A114 732
*Cornell University
- PP 346
Rostker, Bernard, "Selective Service and the All-Volunteer Force," 23 pp., Mar 1982, AD A113 096
- PP 347
McConnell, James, M., "A Possible Counterforce Role for the Typhoon," 24 pp., Mar 1982, AD A116 601
- PP 348
Jondrow, James, and Trost, Robert, "An Empirical Study of Production Inefficiency in the Presence of Errors-in-The-Variables," 14 pp., Feb 1982, AD A113 591
- PP 349
Breckenridge, W. H., and Maimin, O. Kim, "Collisional Intramultiplet Relaxation of $Cd(5s5p^3P_{0,1,2})$ by Alkane Hydrocarbons," 7 pp., Jul 1981. (Published in Journal of Chemical Physics, 76(4), 15 Feb 1982), AD A113 093
*University of Utah, Dept. of Chemistry
- PP 350
Levin, Marc, "A Method for Increasing the Firepower of Virginia Class Cruisers," 10 pp., Apr 1982. (To be published in U.S. Naval Institute Proceedings), AD A116 602
- PP 351
Coutre, S. E.; Stanford, J. M.; Movis, J. G.; Stevens, P. W.; and Wu, T. T., "Possible Three-Dimensional Backbone Folding Around Antibody Combining Site of Immunoglobulin MOPC 167," 18 pp., Apr 1982 (Published in Journal of Theoretical Biology)
*Northwestern University, Depts. of Biochemistry & Molecular Biology and Engineering Sciences & Applied Mathematics
- PP 352
Barfoot, C. Bernard, "Aggregation of Conditional Absorbing Markov Chains," 7 pp., Jun 1982 (Presented to the Sixth European Meeting on Cybernetics and Systems Research, held at the University of Vienna, Apr 1982), AD A116 603
- PP 353
Barfoot, C. Bernard, "Some Mathematical Methods for Modeling the Performance of a Distributed Data Base System," 18 pp., Jun 1982. (Presented to the International Working Conference on Model Realism, held at Bad Honnek, West Germany, Apr 1982), AD A116 604
- PP 354
Hall, John V., "Why the Short-War Scenario Is Wrong for Naval Planning," 6 pp., Jun 1982., AD A118 702
- PP 356
Cyike, Steven; Goldberg, Matthew S.; Hogen, Paul; and Melrs, Lee; "Estimation of the Personal Discount Rate: Evidence from Military Reenlistment Decisions," 19 pp., Apr 1982, AD A122 419
- PP 357
Goldberg, Matthew S., "Discrimination, Nepotism, and Long-Run Wage Differentials," 13 pp., Sep 1982 (Published in Quarterly Journal of Economics, May 1982)
- PP 358
Akst, George, "Evaluating Tactical Command And Control Systems--A Three-Tiered Approach," 12 pp., Sep 1982, AD 122 478
- PP 359
Quester, Aline; Fletcher, Jean; and Marcus, Alan; "Veteran Status as a Screening Device: Comment," 26 pp., Aug 1982, AD A123 658
- PP 361
Quanbeck, David B., "Methods for Generating Aircraft Trajectories," 31 pp., Sep 1982, AD A122 386
- PP 362
Horowitz, Stanley A., "Is the Military Budget Out of Balance?," 10 pp., Sep 1982, AD A122 368
- PP 363
Marcus, A. J., "Personnel Substitution and Navy Aviation Readiness," 35 pp., Oct 1982, AD A122 420
- PP 364
Quester, Aline, and Nakada, Michael, "The Military's Monopsony Power," 29 pp., Oct 1982, AD A123 657
- PP 365
Greer, William L., and Bartholomew, James C., (Cdr.USN), "Psychological Aspects of Mine Warfare," 15 pp., Oct 1982
AD A128 244
- PP 366
Sprulli, Nancy L., and Gastwirth, Joseph L., "On the Estimation of the Correlation Coefficient From Grouped Data," 9 pp., Oct 1982, (Published in the Journal of the American Statistical Association, Sep 1982, Vol. 77, No. 379, Theory and Methods Section), AD A122 382
*George Washington University, Dept. of Statistics
- PP 368
Weinland, Robert G., "The Evolution of Soviet Requirements for Naval Forces--Solving the Problems of the Early 1960s," 41 pp., Dec 1982, AD A123 655
- PP 369
Quester, Aline, and Lockman, Robert, "The All-Volunteer Force: A Positive Perspective," 29 pp., Nov 1982, AD A128 279
- PP 370
Rostker, Bernard D., "Human Resource Models: An Overview," 17 pp., Nov 1982, AD A123 656
- PP 372
Hurley, William J., "An Overview of Acoustic Analysis," 46 pp., Jan 1983, AD A128 316
- PP 373
Jacobson, Louis, "Research to Quantify the Effect of Permanent Change of Station Moves on Wives' Wages and Labor Supply," 35 pp., Jan 1983, AD A128 300
- PP 374
Clay-Mendez, Deborah, and Bails, Ellen, "Balancing Accession and Retention: The Disaggregate Model," 27 pp., Aug 1982
- PP 375
Feldman, Paul, "Privatizing Airports in Washington, D.C.," 17 pp., Feb. 1983, AD A128 236

- PP 376
Weiss, Kenneth G., "Power Grows Out of the Barrel of a Gunboat: The U.S. in Sino-Soviet Crises," 136 pp., Dec 1982
- PP 379
Jondrow, James M.; Chase, David E.; and Gamble, Christopher L., "The Price Differential Between Domestic and Imported Steel," 17 pp., May 1983
- PP 380
Ballis, Ellen, "Balancing Accession and Retention: Cost and Productivity Tradeoffs," 38 pp., Mar 1983
- PP 381
Reeves, John M. L., "CNA's Conceptual Design and Cost Models for High-Speed Surface Craft," 23 pp., Apr 1983, AD A128 245
- PP 382
Levy, Robert A., and Jondrow, James M., "The Adjustment of Employment to Technical Change in the Steel and Auto Industries," 40 pp., May 1983
- PP 383 (Revised)
Thomas, James A., Jr., and Mangel, Marc, "Properties of Quick Look Passive Localization," 39 pp., Jul 1983
- PP 384
Goldberg, Matthew S., and Hager, Michael F., "A Comparison of the Prophet and ACOL Force Projection Models," 35 pp., Jun 1981
- PP 385
Angier, Bruce; Driscoll, Kurt; and Gregory, David, "Manpower Requirements Derivation for the Navy Comprehensive Compensation and Supply Study," 22 pp., Sep 1982
- PP 386
Angier, Bruce N.; Driscoll, Kurt A.; and Carpenter, Kathy A., "Construction of 'Training Cost Per Graduate' for the Navy Comprehensive Compensation and Supply Study," 67 pp., Nov 1982
- PP 387
Ballis, Ellen, and Clay-Mendez, Deborah, "Balancing Accession and Retention: The Aggregate Model," 20 pp., Jul 1982
- PP 388
Clay-Mendez, Deborah, "Models of Accession and Retention," 11 pp., Oct 1982
- PP 389
Clay-Mendez, Deborah, "A Minimum Recruiting Cost Function for Male High School Graduates," 31 pp., Jan 1982
- PP 390
Clay-Mendez, Deborah, "Documentation for the Recruiting Cost Estimates Utilized in the Navy Comprehensive Compensation and Supply Study," 30 pp., Sep 1982
- PP 391
Goldberg, Larry, "Summary of Navy Enlisted Supply Study," 11 pp., Jul 1981
- PP 392
Warner, John T., and Simon, Bruce, "An Empirical Analysis of Pay and Navy Enlisted Retention in the AVF: Preliminary Results," 51 pp., Dec 1979
- PP 394
McGibney, Donald; Camerini, Ugo; Roberts, Arthur; and Winston, Roland, "Development of an Underwater High Sensitivity Cherenkov Detector: Sea Urchin," 20 pp., Aug 1983
- PP 396
Jondrow, James M.; Brechling, Frank; and Marcus, Alan; "Older Workers in the Market for Part-Time Employment," 34 pp., Aug 1983
- PP 398
Levy, Robert A.; Bowes, Marianne; and Jondrow, James M.; "Technical Change and Employment in the Steel, Auto, Aluminum, Coal, and Iron Ore Industries," 25 pp., Sep 1983
- PP 400
Laird, Robbin F., "French Nuclear Forces in the 1980s and 1990s," 37 pp., Aug 1983
- PP 401
Maloney, Arthur P., "The Berlin-Baghdad Railway as a Cause of World War I," 27 pp., Jan 1984
- PP 405
Petersen, Charles C., "Aircraft Carriers in Soviet Naval Theory From 1960 to the Falklands War," 20 pp., Jan 1984
- PP 406
Bowes, Marianne, "Profit-Maximizing vs. Optimal Behavior in a Spatial Setting: Summary and Extensions," 10 pp., Jan 1984
- PP 407
Laird, Robbin F., "The French Strategic Dilemma," 41 pp., Mar 1984

REPROD

FILMED

ADATRO